

On the Leech Fauna of the Hungarian Reach of the Danube (*Danubialia Hungarica*, XLII)

By

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The hirudinological exploration of the Danube, or at least one of its given reaches, had not been made even today. Unfortunately, we miss not only researches of a basic potamobiological point of view, but also faunistical and chorological investigations, indispensable to it, are also in their very beginnings. True, professor DUDICH reports, in his recently published summarizing work, the occurrence of 13 leech species and 2 forms in the Danube (of which the occurrence of 4 species and 2 forms were shown from the Danube for the first time in the present paper), and with due consideration of the fact that according to our present knowledge we might count with but an insignificant increase of the number of species also in the future — and first of all with respect to the live Danube — we still have to admit that the leech fauna of the river is rather incompletely and unevenly known. No regular, hirudinological collecting projects have hitherto been conducted in any given reach of the river. Date received until recently have been published as the results of incidental collectings, or of such with other aims, and represent, as it were, merely by-products of these activities.

It is not in the scope of the present paper to delineate, even as a sketch, the tasks of the hirudinological exploration of the Danube. However, I cannot forego to point out the most important points of view inherent in this endeavour. In the evolvement of the leech fauna of the Danube, the leading role is played by the current of the river and the resultant factors (e. g., the run of the water, drift, reach character) which develop the second main condition, namely suitable places of attachment. Lacking these, and be the other conditions as favourable as possible, even longer or shorter reaches of the Danube may entirely be free of leeches. However, even areas submitting suitable surfaces of attachment will only be colonized by leeches if they offer an adequate food supply (chiefly snails, insect larvae, aquatic Oligochaeta, crustaceans) for the species concerned. Another important factor is the rate of pollution of the water. Only beyond the favourable evolvement of these factors follow the

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other physico-chemical conditions, of which some (e.g. temperature of water, or total alkalinity) are also of a regulative role in the settling of the various species and the quantitative formation of the populations, but hardly as decisive as the preceding ones.

Research material. The majority of the material examined originated from the collections of Dr. Á. BERČÍK, of the Danube Research Station of the Hungarian Academy of Sciences, while a smaller amount was represented by the fragmentary collection saved from the conflagration in 1956 of the Zoological Department of the Hungarian Natural History Museum and the collections of the last few years respectively. The research material comprised 1243 animals of 95 different dates of collectings and derived from 57 habitats of 26 localities (Fig. 1). In the list submitted below, the localities are given in a

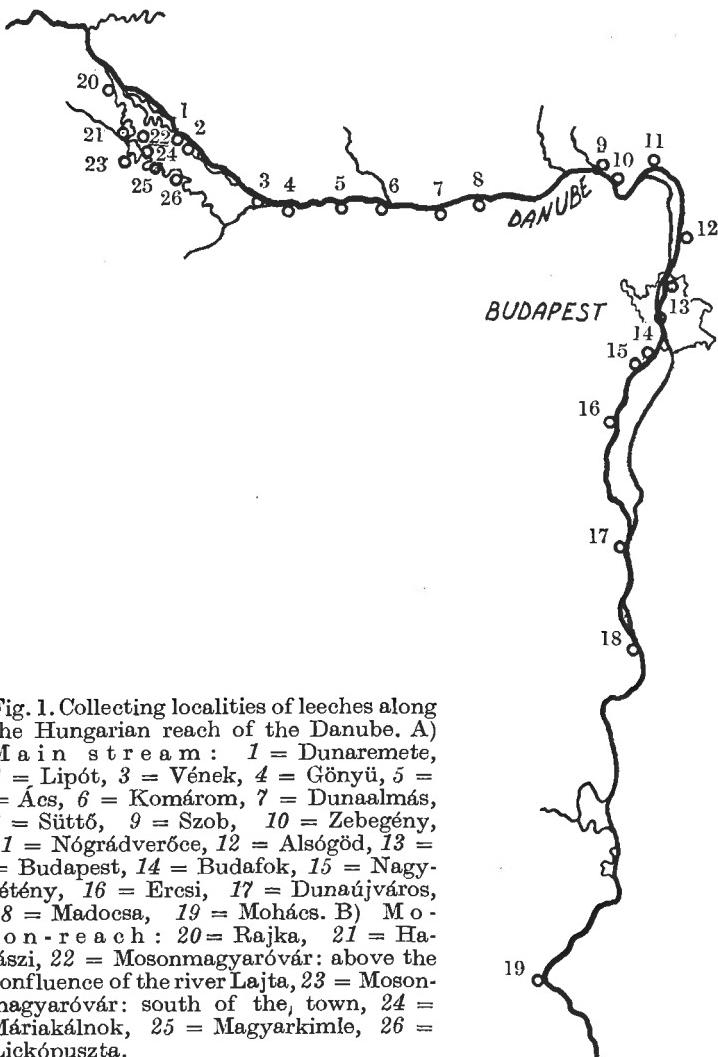


Fig. 1. Collecting localities of leeches along the Hungarian reach of the Danube. A) Main stream : 1 = Dunaremete, 2 = Lipót, 3 = Vének, 4 = Gönyü, 5 = Ács, 6 = Komárom, 7 = Dunaalmás, 8 = Söttő, 9 = Szob, 10 = Zebegény, 11 = Nógrádverőce, 12 = Alságöd, 13 = Budapest, 14 = Budafok, 15 = Nagytétény, 16 = Ercsi, 17 = Dunaújváros, 18 = Madocsa, 19 = Mohács. B) Moson - re a ch : 20 = Rajka, 21 = Hálászi, 22 = Mosonmagyaróvár: above the confluence of the river Lajta, 23 = Mosonmagyaróvár: south of the town, 24 = Máriakálnok, 25 = Magyarkimle, 26 = Lickópuszta.

downstream order, and first those situated along the main stream, followed by those of the Moson-reach (secondary branch) of the Danube. In cases of localities when the data derive from a number of habitats and different dates, they are grouped according to habitats and within them in a sequence of dates. The entire research material is deposited in the collection of the Zoological Department of the Hungarian Natural History Museum.

It is my agreeable duty to express my thanks also in this place to Professor Dr. E. DUDICH, Director of the Danube Research Station of the Hungarian Academy of Sciences, as well as to Dr. Á. BERCZIK, for the cession of the material collected by arduous and exacting work, to be evaluated and deposited in the Hungarian Natural History Museum.

A) Main stream

1. Dunaremete (from stones on the shore), 14 Oct. 1958, leg. BERCZIK:
Glossiphonia complanata (L.), 1 ex.
2. Lipót (pebbly shore), 11 Nov. 1959, leg. BERCZIK:
Erpobdella octoculata (L.), 2 ex.
3. Vének (washed from stones), 16 Sept. 1959, leg. BERCZIK:
Haemopis sanguisuga (L.), 1 ex.
4. Gönyü (from stones on the shore),
 - a) 24 Sept. 1934, leg. DUDICH:
Erpobdella octoculata (L.), 2 ex.
Glossiphonia complanata (L.), 1 ex.
 - b) 17 Sept. 1935, leg. KLEINER:
Glossiphonia complanata (L.), 1 ex.
5. Ács (from stones on the shore), 3 June 1959, leg. BERCZIK:
Dina lineata (O. F. MÜLL.), 1 ex.
6. Komárom (from stones on the shore),
 - a) 15 July 1934, leg. DUDICH:
Erpobdella octoculata (L.), 1 ex.
 - b) 3 June 1959, leg. BERCZIK:
Dina apathyi GEDR. 1 ex.
Dina lineata (O. F. MÜLL.), 1 ex.
Haemopis sanguisuga (L.), 1 ex.
7. Dunaalmás,
 - a) From stones on the shore, 3 June 1959, leg. BERCZIK:
Dina lineata (O. F. MÜLL.), 1 ex.
 - b) From stones along a standing body of water, 9 June 1959, leg. Soós:
Erpobdella octoculata f. *pallida* (Joh.), 1 ex.
8. Süttő (from stones along the shore), 14 Nov. 1963, leg. Miss ZSIRKÓ:
Erpobdella octoculata (L.), 57 ex.

9. Szob (from stones on the shore), 12 Oct. 1934, leg. DUDICH:

Dina lineata (O. F. MÜLL.), 4 ex.
Glossiphonia complanata (L.), 1 ex.

10. Zebegény,

- a) From stones along the shore at the mouth of the Újvölgy, 11 Oct. 1961, leg. BERCZIK:

Dina apathyi GEDR. 2 ex.

- b) Zebegényi-sziget, from stones on the shore, 11 Oct. 1961, leg. BERCZIK:

Dina apathyi GEDR. 2 ex.
Erpobdella octoculata (L.) 1 ex.

- c) From benthos in the section Zebegény-Pilismarót, 4 July 1962, leg. BERCZIK:

Dina lineata (O. F. MÜLL.), 1 ex.

11. Nógrádverőce (from stones on the shore), 12 Oct. 1962, leg. Mrs. VAJDA:

Dina apathyi GEDR., 2 ex.
Dina lineata (O. F. MÜLL.), 7 ex.
Erpobdella octoculata (L.), 2 ex.
Glossiphonia complanata (L.), 1 ex.

12. Alsógöd,

- a) From stones on the shore, 30 Oct. 1957, leg. BERCZIK:

Dina lineata (O. F. MÜLL.), 2 ex.
Erpobdella octoculata (L.), 5 ex.
Glossiphonia complanata (L.), 9 ex.

7 Oct. 1963, leg. Soós:

Dina lineata (O. F. MÜLL.), 2 ex.

- b) Alsögödi-sziget, from stones on the shore, 28 Oct. 1959, leg. Soós:

Erpobdella octoculata (L.), 3 ex.
Glossiphonia complanata (L.), 2 ex.

- c) From stones in seeping springs along the shore, 6 July 1959, leg. PAWLOWSKI & Soós:

Dina apathyi GEDR., 5 ex.

28 Oct. 1959, leg. Soós:

Dina apathyi GEDR., 2 ex.

14 Sept. 1963, leg. Soós:

Dina apathyi GEDR., 7 ex.

13. Budapest,

- a) Dead water reach at Újpest, 19 Sept. 1959, leg. ESZTERGÁLYOS:

Glossiphonia complanata (L.), 4 ex.

- b) From stones under abutment at Buda of the Elisabeth bridge, 7 Oct. 1932, leg. DUDICH:

Erpobdella octoculata (L.), 6 ex.

- c) From stones along the bank below the Mt. Gellérthegy, 15 Sept. 1958, leg. students of State Ballet School:

Dina apathyi GEDR., 3 ex.

Erpobdella octoculata (L.), 5 ex.

Glossiphonia complanata (L.), 5 ex.

21 Sept. 1958, leg. Miss ZSIRKÓ:

- Dina apathyi* GEDR., 3 ex.
Erpobdella nigricollis (BRANDES), 2 ex.
Erpobdella octoculata (L.), 98 ex.
Glossiphonia complanata (L.), 10 ex.

11 May 1959, leg. Soós:

- Erpobdella nigricollis* (BRANDES), 17 ex.

16 Oct. 1959, leg. KERTÉSZ & ZICSI:

- Dina lineata* (O. F. MÜLL.), 8 ex.
Erpobdella octoculata (L.), 6 ex.
Glossiphonia complanata (L.), 3 ex.

16 Oct. 1959, leg. ZICSI:

- Dina apathyi* GEDR., 2 ex.

18 Nov. 1959, leg. Soós:

- Erpobdella nigricollis* (BRANDES), 3 ex.

23 Dec. 1959, leg. Miss ZSIRKÓ:

- Dina lineata* (O. F. MÜLL.), 47 ex.
Erpobdella nigricollis (BRANDES), 46 ex.
Erpobdella octoculata (L.), 77 ex.
Hemiclepsis marginata (O. F. MÜLL.), 2 ex.

3 March 1960, leg. Soós:

- Erpobdella nigricollis* (BRANDES), 8 ex.

10 Oct. 1961, leg. Miss ZSIRKÓ:

- Dina lineata* (O. F. MÜLL.), 8 ex.
Erpobdella nigricollis (BRANDES), 7 ex.
Erpobdella octoculata (L.), 81 ex.
Glossiphonia complanata (L.), 25 ex.
Hemiclepsis marginata (O. F. MÜLL.), 1 ex.

d) From stones along the bank in front of the University of Technical Sciences, 25 Oct. 1959, leg. Miss ZSIRKÓ:

- Dina lineata* (O. F. MÜLL.), 2 ex.
Erpobdella octoculata (L.), 202 ex.
Glossiphonia complanata (L.), 1 ex.

e) From gravelly and stony bank at abutment on Buda of the Petőfi bridge, 13 Sept. 1959, leg. Miss ZSIRKÓ:

- Dina lineata* (O. F. MÜLL.), 1 ex.
Erpobdella octoculata (L.), 53 ex.

14. Budafok (dead water reach of Háros-sziget, from stones on the shore),

a) 22 Oct. 1906, leg. SZÜTS:

- Glossiphonia complanata* (L.), 2 ex.
Hemiclepsis marginata (O. F. MÜLL.), 1 ex.

b) 17 May 1954, leg. Soós:

- Glossiphonia heteroclita* (L.), 1 ex.

15. Nagytétény (from stones along the shore), 8 Oct. 1960, leg. BERCIK:

- Erpobdella octoculata* (L.), 1 ex.

16. Ercsi,

a) From stones of counterfort on left bank, 8 Oct. 1960, leg. BERCIK:

- Dina lineata* (O. F. MÜLL.), 1 ex.
Erpobdella octoculata (L.), 1 ex.

- b) From stones, right bank, 13 July 1962, leg. BERCZIK:
Erpobdella octoculata (L.), 2 ex.
17. Dunaújváros (from benthos), 23 May 1962, leg. BERCZIK:
Erpobdella octoculata (L.), 6 ex.
Glossiphonia complanata (L.), 2 ex.
18. Madoča (from stones along the shore), 6 Oct. 1961, leg. BERCZIK:
Dina lineata (O. F. MÜLL.), 4 ex.
Erpobdella octoculata (L.), 2 ex.
Glossiphonia complanata (L.), 3 ex.
Hemiclepsis marginata (O. F. MÜLL.), 1 ex.
19. Mohács (from stones along the shore), 15 July 1962, leg. BERCZIK:
Erpobdella octoculata (L.), 2 ex.
- B) Moson-reach
20. Rajka,
a) Washed from stones along the shore, 14 Oct. 1958, leg. BERCZIK:
Erpobdella octoculata (L.), 2 ex.
Glossiphonia complanata (L.), 2 ex.
- (b) Washed from stones above the old sluice, 20 July 1964, leg. BERCZIK:
Erpobdella octoculata f. *pallida* (Joh.), 1 ex.
- c) From submerged vegetation, 20 July 1964, leg. BERCZIK:
Glossiphonia heteroclita (L.), 1 ex.
21. Halászsi (near the bridge over river),
a) Washed from *Potamogeton*, 19 June 1963, leg. BERCZIK:
Glossiphonia heteroclita f. *striata* (APÁTHY), 1 ex.
- b) Washed from stone, 19 June 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 12 ex.
22. Mosonmagyaróvár (above the confluence of the river Lajta),
a) Washed from *Potamogeton*, 20 Sept. 1962, leg. BERCZIK:
Erpobdella octoculata (L.), 2 ex.
- b) Washed from vegetation, 20 Sept. 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 8 ex.
- c) Washed from submerged vegetation, 17 July 1963, leg. BERCZIK:
Erpobdella nigricollis (BRANDES), 1 ex.
Erpobdella octoculata (L.), 1 ex.
- d) Washed from wooden pile, 17 July 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 1 ex.
Theromyzon tessulatum (O. F. MÜLL.), 2 ex.
- 16 Oct. 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 1 ex.
- 13 June 1964, leg. BERCZIK:
Erpobdella octoculata (L.), 1 ex.

23. Mosonmagyaróvár (south of the town),
- a) From benthos, 8 Aug. 1962, leg. BERCZIK:
Erpobdella octoculata (L.), 2 ex.
 - b) From stones along the shore, 17 July 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 3 ex.
 - c) Washed from *Potamogeton*, 17 July 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 2 ex.
Helobdella stagnalis (L.), 1 ex.
 - 13 June 1964, leg. BERCZIK:
Erpobdella octoculata (L.), 1 ex.
 - d) Washed from vegetation, 20 Sept. 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 7 ex.
 - 20 Nov. 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 2 ex.
 - 13 June 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 1 ex.
 - e) Washed from stones, 20 Sept. 1962, leg. BERCZIK:
Erpobdella octoculata (L.), 2 ex.
 - 27 May 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 1 ex.
Helobdella stagnalis (L.), 1 ex.
 - 20 Sept. 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 2 ex.
 - 16 Oct. 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 8 ex.
Helobdella stagnalis (L.), 1 ex.
Glossiphonia complanata (L.), 1 ex.
 - 20 Nov. 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 7 ex.
 - 17 Apr. 1964, leg. BERCZIK:
Erpobdella octoculata (L.), 1 ex.

24. Máriakálnok,

- a) Washed from *Potamogeton*, 19 June 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 13 ex.
- b) Washed from stone, 19 June 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 3 ex.
- c) Periphyton from reeds, 19 June 1963, leg. BERCZIK:
Erpobdella octoculata (L.), 5 ex.
- 20 July 1964, leg. BERCZIK:
Erpobdella octoculata (L.), 11 ex.
Hemiclepsis marginata (O. F. MÜLL.), 1 ex.
Piscicola geometra (L.), 1 ex.
- d) Washed from vegetation, 20 July 1964, leg. BERCZIK:
Erpobdella octoculata (L.), 25 ex.
Glossiphonia complanata (L.), 1 ex.

25. Magyarkimle,

a) From stones, 18 May 1962, leg. BERCZIK :

Erpobdella octoculata (L.), 2 ex.

17 July 1963, leg. BERCZIK :

Erpobdella octoculata (L.), 10 ex.

Glossiphonia complanata (L.), 1 ex.

Theromyzon tessulatum (O. F. MÜLL.), 2 ex.

b) From benthos, 8 Aug. 1962, leg. BERCZIK :

Erpobdella octoculata (L.), 7 ex.

27 May 1963, leg. BERCZIK :

Erpobdella octoculata (L.), 7 ex.

Helobdella stagnalis (L.), 1 ex.

c) Washed from vegetation, 20 Sept. 1963, leg. BERCZIK :

Erpobdella octoculata (L.), 8 ex.

20 Nov. 1963, leg. BERCZIK :

Erpobdella octoculata (L.), 1 ex.

d) Washed from stones, 20 June 1962, leg. BERCZIK :

Piscicola geometra (L.), 3 ex.

20 Sept. 1962, leg. BERCZIK :

Erpobdella octoculata (L.), 2 ex.

Theromyzon tessulatum (O. F. MÜLL.), 1 ex.

20 Sept. 1963, leg. BERCZIK :

Erpobdella octoculata (L.), 9 ex.

Glossiphonia complanata (L.), 1 ex.

16 Oct. 1963, leg. BERCZIK :

Dina lineata (O. F. MÜLL.), 2 ex.

Erpobdella octoculata (L.), 7 ex.

Glossiphonia complanata (L.), 4 ex.

Hemiclepsis marginata (O. F. MÜLL.), 1 ex.

20 Nov. 1963, leg. BERCZIK :

Erpobdella octoculata (L.), 4 ex.

13 June 1964, leg. BERCZIK :

Erpobdella octoculata (L.), 4 ex.

26. Lickó-puszta,

a) Washed from stones, 20 June 1962, leg. BERCZIK :

Erpobdella octoculata (L.), 11 ex.

Glossiphonia complanata (L.), 1 ex.

20 Sept. 1963, leg. BERCZIK :

Erpobdella octoculata (L.), 5 ex.

16 Oct. 1963, leg. BERCZIK :

Erpobdella octoculata (L.), 6 ex.

20 Nov. 1963, leg. BERCZIK :

Erpobdella octoculata (L.), 4 ex.

17 Apr. 1964, leg. BERCZIK :

Erpobdella nigricollis (BRANDES), 2 ex.

Erpobdella octoculata (L.), 2 ex.

13 June 1964, leg. BERCZIK:

Erpobdella octoculata (L.), 1 ex.

b) From benthos, 20 June 1962, leg. BERCZIK:

Erpobdella octoculata (L.), 11 ex.

Helobdella stagnalis (L.), 2 ex.

Glossiphonia complanata (L.), 1 ex.

27 May 1963, leg. BERCZIK:

Erpobdella octoculata (L.), 24 ex.

Helobdella stagnalis (L.), 7 ex.

Piscicola geometra (L.), 2 ex.

c) From stones, 17 July 1963, leg. BERCZIK:

Erpobdella octoculata (L.), 15 ex.

Helobdella stagnalis (L.), 3 ex.

d) From submerged vegetation, 17 July 1963, leg. BERCZIK:

Erpobdella octoculata (L.), 9 ex.

Helobdella stagnalis (L.), 1 ex.

Glossiphonia complanata (L.), 1 ex.

Theromyzon tessulatum (O. F. MÜLL.), 3 ex.

e) Washed from vegetation, 20 Sept. 1963, leg. BERCZIK:

Erpobdella octoculata (L.), 7 ex.

20 Nov. 1963, leg. BERCZIK:

Erpobdella octoculata (L.), 8 ex.

13 June 1964, leg. BERCZIK:

Erpobdella nigricollis (BRANDES), 3 ex.

Erpobdella octoculata (L.), 1 ex.

The 1243 specimens studied proved to belong to 11 species and 2 forms. On the basis of researches, collectings, observations and literature data, the following remarks can be made on the taxa concerned.

Ordo I: ARHYNCHOBDELLAE

Familia 1: E r p o b d e l l i d a e

1. *Dina apathyi* GEDROYC, 1916

Material examined: 29 specimens from 10 collectings. Komárom (from stones on the shore, 3 June, 1959, leg. BERCZIK, 1 ex.), Zebegény (from stones on the shore at the mouth of the Újvölgy, 11 Oct., 1961, leg. BERCZIK, 2 ex.; Zebegényi-sziget, from stones on the shore, 11 Oct., 1961, leg. BERCZIK, 2 ex.), Nogradverőce (from stones on the shore, 12 Oct., 1962, leg. Mrs. VAJDA, 2 ex.), Alsógöd (from stones in seeping springs along the shore, 6 July, 1959, leg. PAWLowski & Soós, 5 ex., 28 Oct., 1959, leg. Soós, 2 ex., 14 Sept., 1963, leg. Soós, 7 ex.), Budapest (from stones on the bank below the Mt. Gellért-hegy, 15 Sept., 1958, leg. students of the State Ballet School, 3 ex., 21 Sept., 1958, leg. Miss ZSIRKÓ, 3 ex., 16 Oct., 1959, leg. Zicsi, 2 ex.).

A Ponto-Caspian species. As far as our present information goes, it is known from Hungary, Poland, and the southern parts of the European Soviet Union. According to the author of the species, it occurs in smaller ponds, peat pits, water ditches, and rarely in springs. SANDNER also collected it on one occasion

in great number in peat pits. It was collected in many points along the Komárom—Budapest reach of the Danube. In Hungary, it is primarily known from springs, and its settling in the Danube is also surely connected with them. In the course of our common collectings with Professor PAWLOWSKI in Hungary and Poland, we have established that it occurs in both countries mainly in rivers along whose usually steeply banked reaches there erupt springs, seeping or yielding ample quantities of water. It is worthy of note that some specimens larger (-75 mm) than usual ($40-60$ mm) have been collected, especially among the Budapest and Alsógöd exemplars. The increase in length may refer to changes in the habitat. If our observations and assumption be valid, namely that the species found its way into the Danube by means of the coastal springs, then *Dina apathyi* GEDR. did not arrive upstream into the Danube, like most of the Ponto-Caspian elements of the Hungarian reaches of the river, but is an autochthonous member of our fauna. In the evaluation of the material, I arrived at the conclusion that we have to regard *Dina apathyi* GEDR., beside the three dominant species of the home reaches of the Danube, as one of the most characteristical and hitherto the only concomitant species of the river shown only for the Hungarian section, and this despite the fact that it has not yet been demonstrated from the entire course of the stream in Hungary.

2. *Dina lineata* (O. F. MÜLLER, 1774)

Examined material: 92 specimens from 16 collectings. Ács (from stones on the shore, 3 June, 1959, leg. BERČZIK, 1 ex.), Komárom (from stones on the shore, 3 June, 1959, leg. BERČZIK, 1 ex.), Dunaalmás (from stones on the shore, 3 June, 1959, leg. BERČZIK, 1 ex.), Szob (from stones on the shore, 12 Oct., 1934, leg. DUDICH, 4 ex.), Zebegény (from benthos in the section Zebegény-Pilismarót, 4 July, 1962, leg. BERČZIK, 1 ex.), Nógrádverőce (from stones on the shore, 12 Oct., 1962, leg. Mrs. VAJDA, 7 ex.), Alsógöd (from stones on the shore, 30 Oct., 1957, leg. BERČZIK, 2 ex., 7 Oct., 1963, leg. Soós, 2 ex.), Budapest (from stones along the bank below the Mt. Gellérthegy, 16 Oct., 1959, leg. KERTÉSZ & ZICSI, 8 ex., 23 Dec., 1959, leg. Miss ZSIRKÓ, 47 ex., 10 Oct., 1961, leg. Miss ZSIRKÓ, 8 ex.; from stones along the bank in front of the University of Technical Sciences, 25 Oct., 1959, leg. Miss ZSIRKÓ, 2 ex.; from gravelly and stony bank at abutment on Buda of the Petőfi bridge, 13 Sept., 1959, leg. Miss ZSIRKÓ, 1 ex.), Ercsi (from stones of counterfort on left bank, 8 Oct., 1960, leg. BERČZIK, 1 ex.), Madocsa (from stones along the shore, 6 Oct., 1961, leg. BERČZIK, 4 ex.), Magyarkimle (washed from stones, 16 Oct., 1963, leg. BERČZIK, 2 ex.).

Except for the northern parts, it is distributed in the entire Palaearctic Region, but nowhere frequent. Obtaining gradually more and more informations on its requirements against the various ecological factors, it was found that the species has a wide ecological valency. Earlier, it was stated to be stenotopic, and considered to be characteristic for, and well adapted to, seasonally dry small bodies of standing waters and swamps. However, it was latter found also in larger waters, lakes, brooks, and also smaller streams. Among others, it was also shown that the species can suffer also higher rates of changes in the pH values, oxygen saturation, and total alkalinity. My collectings imply, as was also pointed out once already by BENNIKE, that the leech might have several ecological races. According to my observations, these ecotypes may also differ from each other in features below a taxonomical level of value. Thus all specimens collected from the Danube were unicolorous, entirely lacking the four dark longitudinal stripes characteristic of the species, or at most only the traces of the paramedially situated two longitudinal stripes were suggested by

one or two specimens. It is known from not too many localities in Hungary, but more and more data are being made available by the systematic collecting activities of the recent years. According to AUTRUM, it was found in the Danube (at "Wintershafen") only by STROUHAL's collectings. Unknown until now from the Hungarian reach of the Danube, the species was now demonstrate from 16 sample materials. Almost without exception, it was collected from stones along the shore, and on one occasion in the benthos. The evaluation of the material evinced that *Dina lineata* (O. F. MÜLL.) is generally distributed in the Hungarian reaches of the Danube and that it is one of the characteristic and leading species of the leech fauna of this section.

3. *Erpobdella nigricollis* (BRANDES, 1900)

Examined material: 89 specimens from 9 collectings. Budapest (from stones along the bank below the Mt. Gellérthegy, 21 Sept., 1958, leg. Miss ZSIRKÓ, 2 ex., 11 May, 1959, leg. Soós, 17 ex., 18 Nov., 1959, leg. Soós, 3 ex., 23 Dec., 1959, leg. Miss ZSIRKÓ, 46 ex., 3 March, 1960, leg. Soós, 8 ex., 10 Oct., 1961, leg. Miss ZSIRKÓ, 7 ex.), Mosonmagyaróvár (above the confluence of the river Lajta; washed from submerged vegetation, 17 July, 1963, leg. BERCZIK, 1 ex.), Lickó-puszta (washed from vegetation, 13 June 1964, leg. BERCZIK, 3 ex.).

Except for South Europe, it is known from the whole Europe and West Siberia. The South European occurrence is uncertain, of no reliable data. PAWLowski defined it as a eurytopic species. Though this statement is valid, the species still prefers standings bodies of water. It was found in natural and artifical standing water of the most diverse kinds, being absent only from dystrophic ones. It is frequent also in dead branches of streams, in slowly running branches of rivers, and also in small brooks. Presumably it inhabits the waters of plain and hilly areas. Its occurrence in Hungary was discussed in details in an earlier paper. Hitherto unknown from the Danube, it was found only in the main stream at Budapest, and it seems more frequent in the slowly running water of the Moson-reach. In the main stream, it was always found on stones, whereas it occurred several times also among submerged vegetation in the Moson-reach of the Danube. I have also to remark that the high individual number of the species does not reflect the true ratio as related to the entire amount of the research material, since I have collected it abundantly on several occasions in Budapest for anatomical studies, retaining only the specimens of this taxon from collections of many hundreds of exemplars.

4. *Erpobdella octoeulata* (LINNAEUS, 1758)

Examined material: 906 specimens from 75 collectings. Lipót (pebbly shore, 11 Nov., 1959, leg. BERCIK, 2 ex.), Gönyü (from stones on the shore, 24 Sept., 1934, leg. DUDICH, 2 ex.), Komárom (from stones on the shore, 15 July, 1934, leg. DUDICH, 1 ex.), Dunasármás (from stones along a standing body of water, 9 June, 1959, leg. Soós, 1 ex.; f. *pallida* Joh.), Sütő (from stones along the shore, 14 Nov., 1963, leg. Miss ZSIRKÓ, 57 ex.), Zebegény (Zebegényi-sziget, from stones on the shore, 11 Oct., 1961, leg. BERCIK, 1 ex.), Nogradverőce (from stones on the shore, 12 Oct., 1962, leg. Mrs. VAJDA, 2 ex.), Alsógöd (from stones on the shore, 30 Oct., 1957, leg. BERCIK, 5 ex.; Alsógödi-sziget, from stones on the shore, 28 Oct., 1959, leg. Soós, 3 ex.), Budapest (from stones under abutment at Buda of Elisabeth bridge, 7 Oct., 1932, leg. DUDICH, 6 ex.; from stones along the bank below the Mt. Gellérthegy, 15 Sept., 1958, leg. students of State Ballet School, 5 ex., 21

Sept., 1958, leg. Miss ZSÍRKÓ, 98 ex., 16 Oct., 1959, leg. KERTÉSZ & ZICSI, 6 ex., 23 Dec., 1959, leg. Miss ZSÍRKÓ, 77 ex., 10 Oct., 1961, leg. Miss ZSÍRKÓ, 81 ex.; from stones along the bank in front of the University of Technical Sciences, 25 Oct., 1959, leg. Miss ZSÍRKÓ, 202 ex.; from gravelly and stony bank at abutment on Buda of the Petőfi bridge, 13 Sept., 1959, leg. Miss ZSÍRKÓ, 53 ex.), Nagytétény (from stones along the shore, 8 Oct., 1960, leg. BERCSIK, 1 ex.), Ercsi (from stones of counterfort on left bank, 8 Oct., 1960, leg. BERCSIK, 1 ex.; from stones, right bank, 13 July, 1962, leg. BERCSIK, 2 ex.), Dunaújváros (from benthos, 23 May, 1962, leg. BERCSIK, 6 ex.), Madocsá (from stones along the shore, 6 Oct., 1961, leg. BERCSIK, 2 ex.), Mohács (from stones along the shore, 15 July, 1962, leg. BERCSIK, 2 ex.), Rajka (washed from stones along the shore, 14 Oct., 1958, leg. BERCSIK, 2 ex., washed from stones above old sluice, 20 July, 1964, leg. BERCSIK, 1 ex.; f. *pallida* JOH.), Halászi (washed from stone, 19 June, 1963, leg. BERCSIK, 12 ex.), Mosonmagyaróvár (above the confluence of the river Lajta, washed from *Potamogeton*, 20 Sept., 1962, leg. BERCSIK, 2 ex., washed from vegetation, 20 Sept., 1963, leg. BERCSIK, 8 ex., washed submerged vegetation, 17 July, 1963, leg. BERCSIK, 1 ex., washed from wooden pile, 17 July, 1963, leg. BERCSIK, 1 ex., 16 Oct., 1963, leg. BERCSIK, 1 ex., 13 June, 1964, leg. BERCSIK, 1 ex.), Mosonmagyaróvár (south of the town, from benthos, 8 Aug., 1962, leg. BERCSIK, 2 ex.; from stones along the shore, 17 July, 1963, leg. BERCSIK, 3 ex.; washed from *Potamogeton*, 17 July, 1963, leg. BERCSIK, 2 ex., 13 June, 1964, leg. BERCSIK, 1 ex.; washed from vegetation, 20 Sept., 1963, leg. BERCSIK, 7 ex., 20 Nov., 1963, leg. BERCSIK, 2 ex., 13 June, 1964, leg. BERCSIK, 1 ex.; washed from stones, 20 Sept., 1962, leg. BERCSIK, 2 ex., 27 May, 1963, leg. BERCSIK, 1 ex., 20 Sept., 1963, leg. BERCSIK, 2 ex., 16 Oct., 1963, leg. BERCSIK, 8 ex., 20 Nov., 1963, leg. BERCSIK, 7 ex., 17 Apr., 1964, leg. BERCSIK, 1 ex.), Máriakálnok (washed from *Potamogeton*, 19 June, 1963, leg. BERCSIK, 13 ex.; washed from stone, 19 June, 1963, leg. BERCSIK, 3 ex.; periphyton from reeds, 19 June, 1963, leg. BERCSIK, 5 ex., 20 July, 1964, leg. BERCSIK, 11 ex.; washed from vegetation, 20 July, 1964, leg. BERCSIK, 25 ex.), Magyarkimle (from stones, 18 May, 1962, leg. BERCSIK, 2 ex., 17 July, 1963, leg. BERCSIK, 10 ex.; from benthos, 8 Aug., 1962, leg. BERCSIK, 7 ex., 27 May, 1963, leg. BERCSIK, 7 ex.; washed from vegetation, 20 Sept., 1963, leg. BERCSIK, 8 ex., 20 Nov., 1963, leg. BERCSIK, 1 ex.; washed from stones 20 Sept., 1962, leg. BERCSIK, 2 ex., 20 Sept., 1963, leg. BERCSIK, 9 ex., 16 Oct., 1963, leg. BERCSIK, 7 ex., 20 Nov., 1963, leg. BERCSIK, 4 ex., 13 June 1964, leg. BERCSIK, 4 ex.), Lickó-puszta (washed from stones, 20 June, 1962, leg. BERCSIK, 11 ex., 20 Sept., 1963, leg. BERCSIK, 5 ex., 16 Oct., 1963, leg. BERCSIK, 6 ex., 20 Nov., 1963, leg. BERCSIK, 4 ex., 17 Apr., 1964, leg. BERCSIK, 2 ex., 13 June, 1964, leg. BERCSIK, 1 ex.; from benthos, 20 June, 1962, leg. BERCSIK, 11 ex., 27 May, 1963, leg. BERCSIK, 24 ex.; from stones, 17 July, 1963, leg. BERCSIK, 15 ex.; from submerged vegetation, 17 July, 1963, leg. BERCSIK, 9 ex.; washed from vegetation, 20 Sept., 1963, leg. BERCSIK, 7 ex., 20 Nov., 1963, leg. BERCSIK, 8 ex., 13 June, 1964, leg. BERCSIK, 1 ex.).

Ranging in the entire Palaearctic Region, and the most frequent everyway in Europe, the species has a very high ecological valency, a eurytopic, eurybiont taxon. It can equally be found in standing and running waters of the most diverse types, from the plains to rather high elevations above sea level. It occurs in greater numbers in soft than in hard waters, though it lives also there in all habitats. The species also possesses a great tolerance against pollutions, being the last one of the species surviving in such waters. It can be found in the entire course of the Danube, from its spring to its delta, and whence it had not yet been recorded is doubtless due to a lack of investigations. Despite the fact that it can most frequently be collected from stones, the leech occurs on every kind of living or lifeless substrate affording attachment. Not infrequently it was found also in the benthos, indeed RUSSEV considers it to be one of the characteristic species of the benthos of the Bulgarian reaches of the Danube. Along the Hungarian Danube, it is beyond doubt the commonest leech species. I have identified 906 specimens from 72 collectings. This number represents almost three-quarters (72.9%) of all examined specimens. Although the collections had no claim to be quantitative in character, I still contend that the above number is a true reflection of the real state of affairs and that

a series of quantitative investigations will presumably only increase the rate of occurrence of this species. Though the diverse forms of the different and changing patterns of the species have no taxonomical value, it is still worthy of note that the exemplars studied belonged almost without exception to f. *typica* and f. *vulgaris* (O. F. MÜLL.); not one specimen of f. *atomaria* (CAR.) was found, and only two of f. *pallida* (JOH.). With respect to this latter form I have to remark that it hardly seems to be eurytopic, because up to now it is known only from rivers (though not from the Danube as yet) and the surf zone of the larger lakes, hence being a stenotopic form occurring only in well characterizable physico-chemical and ecological conditions.

Familia 2: Hirudinidae

5. Haemopis sanguisuga (LINNAEUS, 1758)

Examined material: 2 specimens from 2 collectings. Vének (washed from stones, 16 Sept., 1959, leg. BERCZIK, 1 ex.), Komárom (from stones on the shore, 3 June, 1959, leg. BERCZIK, 1 ex.).

Generally distributed in the western part of the Palaearctic Region, it is a frequent and greedy predator. It is the leech of primarily different types of standing, indeed, seasonally drying out, waters, but it occurs also in streams, though merely in their weakly running sections, in the calm estuaries and slow meanders, under stones or among the aquatic vegetation. It was known until recently from the Bulgarian and German reaches of the Danube, now found in two localities in the Hungarian section. However, it was not present in the ample material deriving from the slow Moson-reach of the Danube, wherein one would rather have expected its occurrence.

Ordo II: RHYNCHOBELLAE

Familia 3: Piscicolidae

6. Piscicola geometra (LINNAEUS, 1758)

Examined material: 6 specimens from 3 collectings. Máriakálnok (periphyton from reeds, 20 July, 1963, leg. BERCZIK, 1 ex.), Magyarkimle (washed from stones, 20 June, 1962, leg. BERCZIK, 3 ex.), Lickó-puszta (from benthos, 27 May, 1963, leg. BERCZIK, 2 ex.).

Originally ranging in the Palaearctic Region, it was introduced and now spreading in North America, indeed, it was recently reported of having appeared also in South America. It can be found in standing and running waters, wherever fish live in the zone of vegetation. It was already reported from a number of fish species in the Danube. Being generally distributed in the Danube, we still have specimens only from the Moson-reach in Hungary.

Familia 4: *Glossiphoniidae*

7. *Helobdella stagnalis* (LINNAEUS, 1758)

Examined material: 17 specimens from 8 collectings. Mosonmagyaróvár (south of the town, washed from *Potamogeton*, 17 July, 1963, leg. BERCZIK, 1 ex.; washed from stones, 27 May, 1963, leg. BERCZIK, 1 ex., 16 Oct., 1963, leg. BERCZIK, 1 ex.), Magyarkimle (from benthos, 27 May, 1963, leg. BERCZIK, 1 ex.), Lickó-puszta (from benthos, 20 June, 1962, leg. BERCZIK, 2 ex., 27 May, 1963, leg. BERCZIK, 7 ex.; from stones, 17 July, 1963, leg. BERCZIK, 3 ex.; from submerged vegetation, 17 July, 1963, leg. BERCZIK, 1 ex.).

A far ranging species, distributed all over the world except for the tropics; a eurytopic, eurybiонт taxon. In spite of the fact that it occurs in the most diverse kinds of standing und running waters, indeed also in brack waters, the biggest populations were found to occur mainly in hard, standing bodies of water. In streams, the species lives preponderently in clam, slowly running reaches with hardly any current, though we also have specimens from rapidly running reaches. Every one of the papers discussing the leech fauna of smaller or bigger streams abroad lists it as one of the characteristic and frequent species of these waters. However, it was reported as a member of the benthos of the Danube only from Bulgaria up to now. In the course of our home investigations, it had not yet been found in the main stream, only in the slowly running water of the Moson-reach. In this section, it was found mainly in the benthos, but also from submerged vegetation and in the materials washed from stones.

8. *Glossiphonia complanata* (LINNAEUS, 1758)

Examined material: 84 specimens from 25 collectings. Dunaremete (from stones on the shore, 14 Oct., 1958, leg. BERCZIK, 1 ex.), Gönyü (from stones on the shore, 24 Sept., 1934, leg. DUDICH, 1 ex., 17 Sept., 1935, leg. KLEINER, 1 ex.), Szob (from stones on the shore, 12 Oct., 1934, leg. DUDICH, 1 ex.), Négrádverőce (from stones on the shore, 12 Oct., 1962, leg. Mrs. VÁJDA, 1 ex.), Alsógöd (from stones on the shore, 30 Oct., 1957, leg. BERCZIK, 9 ex.; Alsógödi-sziget, from stones on the shore, 28 Oct., 1959, leg. Soós, 2 ex.), Budapest (dead water reach at Újpest, 19 Sept., 1959, leg. ESZTERGÁLYOS, 4 ex.; from stones along the bank below the Mt. Gellérthegy, 15 Sept., 1958, leg. students of State Ballet School, 5 ex., 21 Sept., 1958, leg. Miss ZSIRKÓ, 10 ex., 16 Oct., 1959, leg. KERTÉSZ & ZICSI, 3 ex., 10 Oct., 1961, leg. Miss ZSIRKÓ, 25 ex.; from stones along the bank in front of the University of Technical Sciences, 25 Oct., 1959, leg. Miss ZSIRKÓ, 1 ex.), Budafok (dead water reach of Háros-sziget, from stones on the shore, 22 Oct., 1906, leg. SZÚTS, 2 ex.), Dunatújváros (from benthos, 23 May, 1962, leg. BERCZIK, 2 ex.), Madocsa (from stones along the shore, 6 Oct., 1961, leg. BERCZIK, 3 ex.), Rajka (washed from stones along the shore, 14 Oct., 1958, leg. BERCZIK, 2 ex.), Mosonmagyaróvár (south of the town, washed from stones, 16 Oct., 1963, leg. BERCZIK, 1 ex.), Máriakálnok (washed from vegetation, 20 July, 1964, leg. BERCZIK, 1 ex.), Magyarkimle (from stones, 17 July, 1963, leg. BERCZIK, 1 ex.; washed from stones, 20 Sept., 1963, leg. BERCZIK, 1 ex., 16 Oct., 1963, leg. Berczik 4 ex.), Lickó-puszta (washed from stones, 20 June, 1962, leg. BERCZIK, 1 ex.; from benthos, 20 June, 1962, leg. BERCZIK, 1 ex.; from submerged vegetation, 17 July, 1963, leg. BERCZIK, 1 ex.).

A eurybiонт species of an immense area: it is known from Europe, Asia, North America, the Argentine, and the Congo. Equally occurring in standing and running waters, the species seems to be more frequent in the latter ones. Though, according to MANN's investigations, it inhabits soft as well as hard waters, the greatest populations evolve in harder ones. In general, it inhabits the coastal zone of shallow waters, but it also descends further down than other leech species. Thus, e. g., it was collected at a depth of 120 m in the Neu-

châtel Lake. In the waters of the high mountain ranges, it advances also to elevations of 2000 m. I have discussed its distribution in Hungary in details in a special paper. Distributed in the entire Danube, it is unreported only from still uninvestigated reaches. Along the Hungarian reach of the river, it was found in 25 collectings. It was most frequently taken from stones along the shore, but twice found also in the benthos. In the evaluation of the material, it was proven to be one of the characteristic and constant leading species of the Hungarian reaches of the Danube.

9. *Glossiphonia heteroclita* (LINNAEUS, 1761)

Examined material: 3 specimens from 3 collectings. Budafok (dead water reach of Hárós-sziget, from stones on the shore, 17 May, 1954, leg. Soós, 1 ex.), Rajka (from submerged vegetation above the old sluice, 20 July, 1964, leg. BERČÍK, 1 ex.), Halászi (washed from *Potamogeton* near the bridge over the river, 19 June, 1963, leg. BERČÍK, 1 ex.; f. *striata* APÁTHY).

Of a smaller area than its preceding congener, the species is known from Europe, North America, India, East and Central Africa. A typical species of standing waters, it was still found several times in very slowly streaming coastal waters with dense vegetation. In contrast with *Glossiphonia complanata* (L.), the leech inhabits primarily soft water habitats. It was already known from the upper reaches of the Danube, from Germany and Czechoslovakia. The material under study yielded one specimen each from merely three points of the Hungarian Danube. The main stream locality (the dead branch at the island Hárós), might be considered as a practically standing body of water; one of the specimens found in the Moson-reach was f. *striata* (APÁTHY), as yet unknown from the Danube. The species is a potamoxenic element in the live Danube.

10. *Theromyzon tessulatum* (O. F. MÜLLER, 1774)

Examined material: 8 specimens from 4 collectings. Mosonmagyaróvár (above the confluence of the river Lajta, washed from wooden pile, 17 July, 1963, leg. BERČÍK, 2 ex.), Magyarkimle (from stones, 17 July, 1963, leg. BERČÍK, 2 ex.; washed from stones, 20 Sept., 1962, leg. BERČÍK, 1 ex.), Lickó-puszta (from submerged vegetation, 17 July, 1963, leg. BERČÍK, 3 ex.).

Aside of the Holarctic territories, it can be found also in South America and East Africa. The species inhabits preponderantly the coastal zone of larger standing waters with vegetation, feeding on the blood of birds. It is considerably rarer in running streams, and completely absent from rivers with a high current. Hitherto unknown from the Danube, the specimens found in the four collectings all derive from localities along the slowly streaming Moson-reach.

11. *Hemiclepsis marginata* (O. F. MÜLLER, 1774)

Examined material: 7 specimens from 6 collectings. Budapest (from stones along the bank below the Mt. Gellérthegy, 23 Dec., 1959, leg. Miss ZSIRKÓ, 2 ex., 10 Oct., 1961, leg. Miss ZSIRKÓ, 1 ex.), Budafok (dead water reach of Hárós-sziget, from stones on the shore, 22 Oct., 1966, leg. SZŰTS, 1 ex.), Madocsa (from stones along the shore, 6 Oct., 1961, leg. BERČÍK, 1 ex.), Máriakálnok (periphyton from reeds, 20 July, 1964, leg. BERČÍK, 1 ex.), Magyarkimle (washed from stones, 16 Oct., 1963, leg. BERČÍK, 1 ex.).

Mainly a Palaearctic species, it is known also from Sumatra and India. It inhabits mostly bound to the vegetation, the smallest standing waters to the biggest lakes, frequently appearing as a fish parasite. The leech is considerably rarer in streaming waters. Sucking the blood of fish, amphibians and their larvae, it was also recorded as feeding on the body fluids of snails. Up to now, it was listed from the German and Rumanian reaches of the Danube, as a fish parasite. In the Hungarian Danube, it was collected both in the main stream and in the Moson-reach, usually from stones.

Summarizing and evaluating the results of the study, one can, at this point of the investigations, establish the fact that the Hungarian reaches of the Danube have three dominant leading species, namely *Erpobdella octoculata* (L.), *Glossiphonia complanata* (L.), and *Dina lineata* (O. F. MÜLL.). These three species represent about 80—90 per cent of the leech fauna inhabiting the river. *Dina apathyi* GEDR. is a most characteristic concomitant species of the fauna in the Hungarian reach of the Danube. As a negative feature, one has to point out that *Helobdella stagnalis* (L.) has not yet been shown from the main stream, though it appears among the dominant and characteristic species in all other, smaller to bigger, European streams hitherto studied.

REFERENCES

1. AUTRUM, H.: *Hirudinea*. In: BROHMER: Die Tierwelt Mitteleuropas, Leipzig, 1, Lief. 7b, 1958, pp. 30.
2. BENNIKE, S. A. B.: Contribution to the ecology and biology of the Danish fresh-water leeches (*Hirudinea*). Fol. Limnol. Scand., No. 2, 1943, p. 1—109.
3. BRTEK, J. & ROTHSCHEIN, J.: Ein Beitrag zur Kenntnis der Hydrofauna und des Reinheitszustandes des tschechoslowakischen Abschnittes der Donau. Biol. Práce, Bratislava, 10, 1964, p. 1—62.
4. DUDICH, E.: A Duna állatvilága. Természettudomány, 3, 1948, p. 166—180.
5. DUDICH, E.: Systematisches Verzeichnis der Tierwelt der Donau mit einer zusammenfassenden Erläuterung. In: Limnologie der Donau, Lief. 5, 1967, p. 4—69.
6. DUDICH, E. & KOL, E.: Kurzbericht über die Ergebnisse der biologischen Donaufor-schungen in Ungarn bis 1957. (*Danubialia Hungarica, I.*) Acta Zool. Hung., 5, 1959, p. 331—339.
7. DVIGHALY, T. Zs. & KOZMA, E. V.: Chemical investigations on the Hungarian section of river Danube. (*Danubialia Hungarica, V.*) Acta Univ. Sci. Budapestiensis, Sect. Biol., 3, 1960, p. 145—154.
8. DYK, V.: Der gleichzeitige Zustand über die Parasiten der slowakischen Fische. Biológia, Bratislava, 10, 1955, p. 162—172.
9. MANN, K. H.: The life history of *Erpobdella octoculata* (Linnaeus, 1758). J. Anim. Ecol., 22, 1953, p. 199—207.
10. MANN, K. H.: A key to the British freshwater leeches with notes on their ecology. Fresh-water Biol. Assoc., Sci. Publ., No. 14, 1954, pp. 21.
11. MANN, K. H.: Some factors influencing the distribution of freshwater leeches in Britain. Proc. Int. Assoc. theor. appl. Limnol., 12, 1955, p. 582—587.
12. MANN, K. H.: A study of a population of the leech *Glossiphonia complanata* (L.). J. Anim. Ecol., 26, 1957, p. 99—111.
13. MANN, K. H.: The breeding, growth and age structure of a population of the leech *He-lobdella stagnalis* (L.). J. Anim. Ecol., 26, 1957, p. 171—177.
14. MANN, K. H.: *Hirudinea*. In: ILLIES: Limnofauna Europaea, Stuttgart, 1967, pp. 474, spec. p. 118—122.
15. PAWLOWSKA, T.: Pijawki (*Hirudinea*) dorzecza srodkowej Warty (Les sangsues du bassin de la Warta moyenne). Zesz. Nauk. Uniw. Łódzkiego, Ser. II, No. 14, 1963, p. 123—132.

16. PAWLowski, L. K.: *Pijawki (Hirudinea)*. In: Fauna Śląskowodna Polski, Warszawa, No. 26, 1936, pp. 176.
17. PAWLowski, L. K.: Zur Ökologie der Hirudineenfauna der Wigryseen. Arch. Hidrobiol. et Ichtyol. Suwalki, 10, 1936, p. 1—47.
18. POPESCU, E. & PRUNESCU-ARION, E.: Contributiuni la studiul faunei bentonice din Dunare in regiunea cataractelor (km 1042—km 955). Rev. Biol. Bucuresti, 5, 1960, p. 345—362.
19. REICHENBACH-KLINKE, H.-H.: Die Parasiten der Donaufische. Arch. Hydrobiol., Suppl. Donauforschung, 27, 1962, p. 40—56.
20. RUSSEV, B.: Beitrag zur Erforschung des Makrobenthos der Donau am bulgarischen Ufer. C. R. Acad. Bulg. Sci., 12, 1959, p. 345—348.
21. RUSSEV, B.: Das Zoobenthos der Donau zwischen dem 845 und 375 Flusskilometer. I. Zusammensetzung, Verteilung und Ökologie. Bull. Inst. Zool. Mus. Acad. Bulg. Sci., 20, 1966, p. 55—131.
22. RUSSEV, B. & MARINOV, T.: Über die Polychäten- und Hirudineenfauna im bulgarischen Sektor der Donau. Bull. Inst. Mus. Zool. Acad. Sci., 15, 1964, p. 191—197.
23. SANDNER, H.: Badania nad fauną pijawek. Acta Zool. Oecol. Univ. Lódz., No. 4, 1951, pp. 50.
24. SANDNER, H.: Recherches sur les faune des sangsues. Bull. Soc. Sci. Lett. Lódz., Cl. III, 5, 1954, p. 1—16.
25. SOÓS, Á.: New leeches (Hirudinea) from the Fauna of Hungary. Ann. Hist.-nat. Mus. Nat. Hung., 55, 1963, p. 285—292.
26. SOÓS, Á.: A revision of the Hungarian fauna of rhynchobdellid leeches (Hirudinea). Opusc. Zool. Budapest, 5, 1964, p. 107—112.
27. TSEYEB, J.: Zooplankton of the Soviet section of the Danube. Akad. Nauk. Ukr., Kiew, 36, 1961, p. 103—127.
28. WOJTAŚ, F.: Pijawki (Hirudinea) Lysogór, Zesz. Nauk. Uniw. Lódzkiego, Ser. II, No. 3, 1957, p. 51—69.
29. WOJTAŚ, F.: Pijawki (Hirudinea) rzeki Grubia. Soc. Sci. Lódz., Sect. III, No. 58, 1959, pp. 64.